

Mid-term exam (March 19, Monday) will cover the following materials. 90% of questions will come from this study guide!

The exam will include (1) multiple choices; (2) short answers; (3) short essays.

1. Quizzes A few questions will come from the first 2 quizzes.

2. Lecture notes:

a. Proximate and ultimate causes.

Which ones of the followings are proximate or ultimate causes of behavior: evolutionary history, phylogeny, adaptive function, development, physiological, hormonal and neural mechanism of behavior. Animal behaviorists assume animal behavior is evolved through natural selection, How is a behavioral trait evolved through natural selection?

b. Learned and innate behavior.

Why (ultimate cause) do animals evolve innate or learned behavior, what is the benefit and cost of evolving learned or innate behavior? What is a releaser (or sign stimulus) and its function? Know the differences between classical and operant conditioning, and provide examples. Define unconditioned, conditioned stimulus / response. What is imprinting? The differences between sexual and filial imprinting, and provide examples. Compare the behavioral and anatomical differences between vocal learning and non-learning species in birds. Learned behavior always has its genetic basis, innate behavior can be modified by experience (learned), provide examples. Most learned behaviors are under the control of genetic (innate) program.

C. Foraging behavior

What is echolocation? And what animals use echolocation? How do honeybee workers communicate with each other to find the location of food resource? How does the waggle dance work? Honeybees have specialized brain area, specialized hormone, and gene for foraging. How do osprey acquire information of food source from neighbors? Provide examples that animals evolve behavioral strategy to deceive the prey. Design an experiment to determine the cause and effect between these factors and foraging behavior. Food storing and hippocampus size. Design an experiment to determine whether the hippocampus may vary in size dependent food storing behavior. Optimal model of foraging behavior and provide examples. Why do animals consume spices, is there adaptive advantage? Why do Macaws eat clay?

D. Antipredator behavior

Identify the antipredator strategies that animals have evolved, and provide examples. (a) avoid detection by predator: cryptic behavior. (b) when encountering the predator: Warning signal; stay vigilant to flee, or attack the predator (mobbing). Identify the differences between Batesian and Mullerian mimicry. Why island animals tend to be slower and tame, compare to their mainland relatives?

E. Dispersal, Migration and navigation

Define dispersal and migration and provide examples. Why do animals disperse (instead of staying at natal area)? Why (ultimate causes) do animals migrate? Describe Monarch butterfly's multi-generation migration, is it learned or innate behavior? How (proximate causes) do animal migrate—Sun compass; Star compass, Magnetic field, Olfactory map, Landscape etc. Many animals use a combination of

methods to orient their migratory routes. Design experiments to test whether animals can use a specific compass for orientation. Hippocampus and spatial orientation in animals and humans; why do new neurons grow in hippocampus of London taxi drivers.

e. Sexual selection

Define two categories of sexual selection: male-male competition and female choice (they are not mutually exclusive). The fundamental differences between males and females, and how these differences might affect mate choice. Why sex? What is the benefit/ cost of sexual vs. asexual reproduction? What is Red-Queen hypothesis, define it and provide an example.

2. Reading assignments:

a. FoxP2 gene and speech learning. What is the evidence to show FoxP2 is associated with human speech learning? The function of *FoxP2* in birds, mice, bats, and humans. How do you design an experiment to test the role of a gene, such as FoxP2, on vocal learning behavior?

b. Cryptochrome gene: What is the function of cryptochrome gene in fruit fly and in humans? How did scientists design the experiment to test the possible function of human cryptochrome (cry) gene?

c. Food caching in scrub jays: What experiments were done in this article to demonstrate the future planning of food caching behavior.

d. The fattest ape. Why do humans have evolved to be the fattest apes (evolutionary adaptation of producing and maintaining fat tissues)? How is this adaptation associated with evolution of human brains?

e. Mimicry gene (*Optix*). What does this *Optix* gene do in butterfly? What genetic mechanism to make two butterfly species evolve the same wing pattern?

f. Red-queen hypothesis: In this article, Name at least one experiment or evidence is to support the red-queen hypothesis?

Go over the materials at least two times (memorize it on Saturday, and rehearse on Sunday and Monday morning, wire-up your synapses for longer-term memory) and make good use of your developing brain! Don't hesitate to contact me if you have questions (liuw@mail.rockefeller.edu). Good luck!